PRESENCE OF THE RUSTY PLUM APHID *HYSTERONEURA SETARIAE* (THOMAS) (HEMIPTERA: APHIDIDAE) ON BUFFEL GRASS (*CENCHRUS CILIARIS* L.) IN CENTRAL AUSTRALIA

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Abstract

Eight populations of the introduced rusty plum aphid, *Hysteroneura setariae* (Thomas), were discovered on the introduced pasture plant buffel grass (*Cenchrus ciliaris* L.) in Alice Springs from May 2008 to April 2009. Aphids were not found on eight other grass species also surveyed during this period. This is the first fully documented record of *H. setariae* in the southern half of the Northern Territory. *Hysteroneura setariae* is a vector of several plant viruses. The possible significance of buffel grass in reducing invertebrate biodiversity is discussed.

Introduction

The rusty plum aphid, *Hysteroneura setariae* (Thomas), is endemic to North America but expanded rapidly in the mid 1960s and spread throughout many parts of the world (Blackman and Eastop 2006). Since then its distribution has continued to expand, *e.g.* to Taiwan (Lee and Hsu 1979) and Chile (Heie *et al.* 1996). Its biology was described by Carver (1976), who included a list of host plants. More recent accounts have added Cyperaceae, oil and coconut palms as occasional hosts (Blackman and Eastop 2006) as well as other species such as *Scaevola taccada* (Goodeniaceae) (Messing *et al.* 2007).

Buffel grass (*Cenchrus ciliaris* L.) (Poaceae) is a pasture plant native to Africa, southern parts of Asia and India (Lazarides *et al.* 1997). Although accidentally introduced into Australia during the 19th century, buffel grass was deliberately sown throughout Queensland, New South Wales and northern parts of the Northern Territory between the 1920s and the 1960s (Humphreys 1967, Cameron *et al.* 1984). It now occurs over much of central Australia and is known to have deleterious effects on native plant species in the region (*e.g.* Clarke *et al.* 2005). However, the effects of buffel grass on invertebrate diversity in Australia have been largely unknown.

Invertebrate faunal surveys of buffel grass growing in Alice Springs, conducted from May to September 2008, revealed the presence of *H. setariae*. This led to the question of whether *H. setariae* is found only on buffel grass in Alice Springs, so surveys were expanded from November 2008 to April 2009 to include native grasses and other introduced grasses. Results of these surveys are presented here, together with a discussion of the possible effects of both *C. ciliaris* and *H. setariae* on agricultural, horticultural and natural environments.

Methods

Surveys comprised, firstly, close visual inspection of plants and then beating vegetation into trays. Plants were only surveyed if they were green, indicating

access to water and increased likelihood of feeding by phytophagous insects. A survey of each grass species at each site comprised sampling six plants. The extent of distribution of each grass in Alice Springs - and therefore the number of potential survey sites - varied between species, partly because some parts of the town receive more water than others. Therefore, species could not be sampled equally.

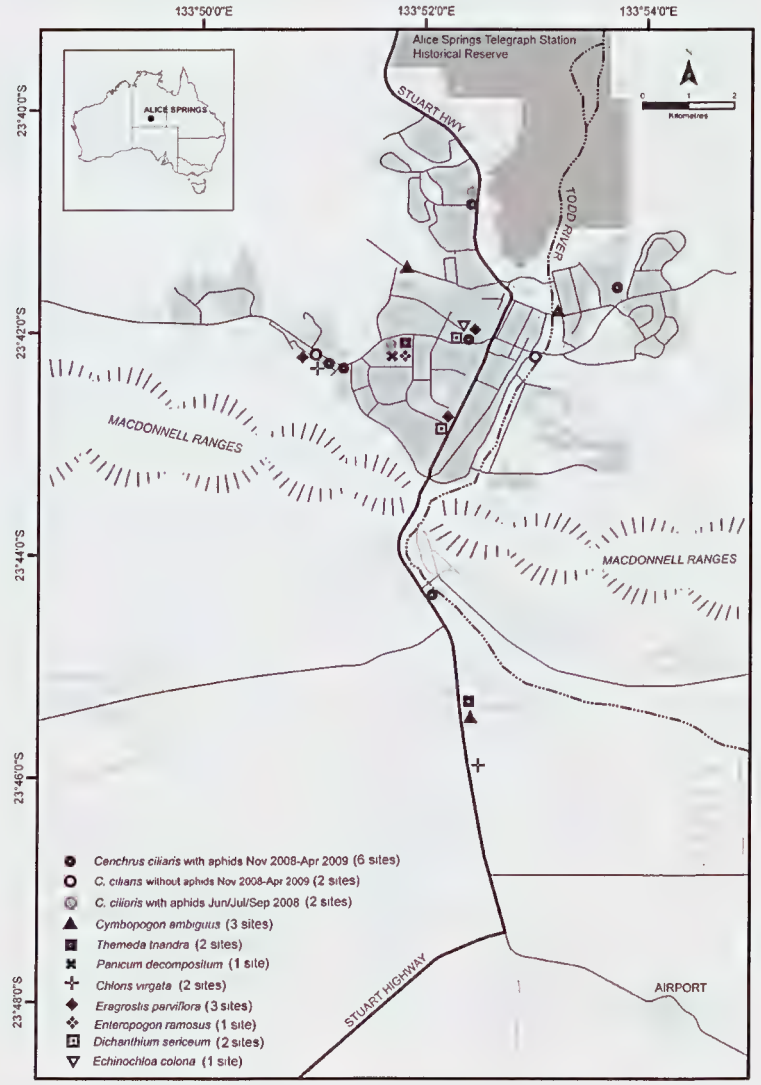

Fig. 1. Map of the Alice Springs area showing the species and distribution of grasses surveyed for *H. setariae* from November 2008 to April 2009.

The following introduced species were surveyed from November 2008 to April 2009: *Cenchrus ciliaris* (eight sites), *Chloris virgata* (two sites) and *Echinochloa colona* (one site). The following native species were also surveyed during this period: *Cymbopogon ambiguus* (three sites), *Dichanthium sericeum* (two sites), *Enteropogon ramosus* (one site), *Eragrostis parviflora* (three sites), *Panicum decompositum* (one site) and *Themeda triandra* (two sites). Grass species were interspersed (Fig. 1).

Results

Two populations of *H. setariae* were discovered during surveys of *C. ciliaris* in parkland in June, July and September 2008. Associated with aphids at the first parkland site in June and July 2008 were numerous adults and larvae of the widespread native aphid predator *Coccinella transversalis* Fabricius (Coleoptera: Coccinellidae). Tending aphids in November 2008 were workers of the commonly encountered native ant *Monomorium sordidum* Forel (Hymenoptera: Formicidae).

Six of the eight *C. ciliaris* sites surveyed from November 2008 to April 2009 yielded populations of *H. setariae* (Fig. 1). The population size of aphids on individual plants varied between one winged female with three nymphs to hundreds of individuals comprising winged and wingless females and nymphs of both morphs. Aphids were found only on the inflorescence and peduncle. The rusty plum aphid was not found on any other native or introduced grass sampled during this study.

Discussion

Although the present study is the first time that *H. setariae* has been documented from the southern half of the Northern Territory, additional records without locality information indicate that the rusty plum aphid has been collected from this area in the past (M. Carver pers. comm.). This species has also been collected from at least two other localities in the central arid zone: 30 km southeast of the Dalhousie homestead ruins in South Australia on 23 September 1974 (Carver 1976) and 1 km west of Birdsville in southwestern Queensland (date unknown) (M. Carver pers. comm.). Opportunistic collections in central Australia in 1966 yielded only three species: *Aphis craccivora* Koch, *Lipaphis erysimi* (Kaltenbach) and *Rhopalosiphum maidis* (Fitch) (White 1967).

Blackman and Eastop (2006) did not cite *H. setariae* as occurring on buffel grass, although they noted records from other species of *Cenchrus*. The rusty plum aphid was found on *C. ciliaris* in southwestern Australia in the summer of 2000 (Hawkes and Jones 2005) and buffel grass is known to support *H. setariae* in northern Australia (M. Carver pers. comm.).

Buffel grass supports another likely introduced species in Alice Springs: the sugarcane whitefly *Neomaskellia bergii* (Signoret) (Hemiptera: Aleyrodidae) (Palmer 2009), which colonises several introduced grasses and was first

collected in Australia on sugar cane near Cairns in 1918 (Carver and Reid 1996). Buffel grass has had negative effects on invertebrate diversity in semi-arid regions of other countries, where infestations have led to reduced abundance of arthropods in the U.S.A. (Flanders *et al.* 2006) and likely alteration of ant community composition in Mexico (Bestelmeyer and Schooley 1999).

Worldwide, the rusty plum aphid is a vector of at least twelve plant viruses, including the cucumber, soybean and sugarcane mosaic viruses (Table 1). Although all of the viruses listed in Table 1 are non-persistently transmitted (Brunt *et al.* 1996, Latham and Jones 2004, Tian *et al.* 2007), and many of the crops shown in Table 1 are not normally host plants for *H. setariae*, virus transmission would still be possible during incidental insertion of mouthparts as the aphid locates suitable species. In Australia, the rusty plum aphid has also been implicated in transmitting *Barley yellow dwarf virus*, a persistent virus infecting both native and introduced grasses (Hawkes and Jones 2005).

Table 1. Plant viruses transmitted by the rusty plum aphid *Hysteroneura setariae*.

Virus	Reference
Carrot virus Y	Latham and Jones 2004
Cucumber mosaic virus	Coudriet 1962
Maize dwarf mosaic virus	Garrido and Cermeli 1994
Onion yellow dwarf virus	Drake *et al.* 1933
Papaya ringspot virus	Trinidad and Sumalde 2006
Soybean mosaic virus	Neto and Costa 1978
Sugarcane mosaic virus	Ingram and Summers 1936
Tobacco vein-banding mosaic virus	Chin 1983
Urd bean leaf crinkle virus	Nath *et al.* 1986
Watermelon mosaic 1 virus	Chao and Chen 1991
Watermelon mosaic 2 virus	Coudriet 1962
Zucchini yellow mosaic virus	Chao and Chen 1990

Exotic aphids are generally rare on native Australian plants (Carver 1991), but host plant preferences can be variable within the Aphididae: some overseas studies (*e.g.* Malmstrom *et al.* 2005) reported a preference by exotic aphids for non-indigenous plants as well as a higher fecundity on them, whereas other studies (*e.g.* Messing *et al.* 2007) reported many aphid species - including *H. setariae* - attacking indigenous plants. Although *H. setariae* was collected from *Eragrostis parviflora* in Atherton, Queensland in 1970 and from *Panicum decompositum* in northern South Australia in 1974 (Carver 1976), the rusty plum aphid was not found on these or any other native or introduced grass in Alice Springs during 2008 and 2009. The distribution of *H. setariae* and surveyed grasses shown in Fig. 1 may indicate a host preference for *C. ciliaris*, although this needs to be determined experimentally.

The distribution of *H. setariae* in Australia has expanded as a result of the presence of buffel grass. With favourable climatic conditions this aphid is potentially present in all habitats in which *C. ciliaris* occurs; neither species has been collected from Victoria or Tasmania (M. Malipatil pers. comm., Sharp and Simon 2002). The current study demonstrates that an introduced floral species has provided resources for an exotic faunal species, which in turn is a vector of several plant viruses. The increased incidence of viral infection of crops and other plants as a result of the expanded distribution of aphid and grass also seems likely.

Acknowledgements

Dr Mary Carver kindly identified exemplars of *H. setariae* and both Mary Carver and Dr Mali Malipatil (Victorian Department of Primary Industries) provided information on collecting localities. Ms Carly Steen (NT Parks and Wildlife) produced much of Figure 1.

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